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(54) FUEL FILTER

BRENNSTOFFILTER

FILTRE A CARBURANT

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(73) Proprietor: **Filtertek, S.A.**
F-60128 Plailly (FR)

(72) Inventor: **CHIGA, Antonio**
F-77230 Dammartin-en-Goele (FR)

(74) Representative: **Brose, D. Karl et al**
Patentanwälte Brose & Brose
Postfach 11 64
82301 Starnberg (DE)

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Description

FIELD OF THE INVENTION

[0001] The invention relates to a fuel filter which by means of a pump connection neck is attached to an in-tank fuel pump, the filter having a supporting body consisting of plastics which is completely enclosed in a plastic filter fabric, wherein the fuel is sucked through the filter fabric wherein the pump connection neck is positioned on the top of the filter, the lower end of which is extending close to the bottom of the filter and wherein the pump connection neck has an inlet opening, which is surrounded by a plurality of supporting feet.

BACKGROUND OF THE INVENTION

[0002] A fuel filter of the above kind, for example, is disclosed in the DE 39 14 938 C1.

[0003] Fuel filters of this kind are characterized by a extremely simple construction and are especially useful to be mounted within a fuel tank of motor driven vehicles. The filter function is performed by the filter fabric. The supporting body maintains the distance between the bottom side and the top side of the filter fabric, forming a filter body, because otherwise both sides could partially contact each other, which would decrease the available filter area.

[0004] Fuel filters of this kind, in the most cases, are closely mounted to a conveying means, especially a fuel pump, which is also positioned in the fuel tank. In installations of this kind, the filter is connected to the pump connection neck, either directly or by a suction line, and therefore forms a body which can vibrate and transfer vibrations during the operation of the pump or other conveying means. In many cases the transfer of such vibrations creates undesired sounds. In connection with the filters of DE 39 14 938 C1, attempts have been made to reduce such sounds by a special design of the supporting body. However, these attempts were not completely successful.

SUMMARY OF THE INVENTION

[0005] The task to be solved by the instant invention consists in, to provide a filter of the above identified kind, having an extremely simple construction and simultaneously reducing the undesired noises during the operation of the filter.

[0006] According to the invention, this task is solved by the features, that the bottom ends of the supporting feat are connected by a plastic disk inside the filter fabric, which is extending normal to the axis of the pump connection neck and in that the plastic disk is overlaying the inlet opening, such, that the filtered fuel only or at least predominately can flow radially into the inlet opening of the pump connection neck.

[0007] This feature ensures a radial flow of the filtered fuel into the pump neck. This results in the advantage that vibrations to the fuel tank are reduced, which had been the case when the fuel was flowing in a perpendicular or axial direction through the pump connection neck. Therefore, by this invention a substantial reduction of the undesired sounds is achieved.

[0008] In one preferred embodiment according to the invention, the plastic disk is completely covering the inlet opening of the pump connection neck.

[0009] In an alternative preffered embodiment the plastic disk is slightly smaller than the diameter of the inlet opening of the pump connection neck.

[0010] An improvement of the invention consist in the fact, that the plastic disk extends parallel to the bottom of the filter within the filter fabric.

[0011] It is preferred that the side of the plastic disk facing the filter fabric on the bottom of the filter has a smooth surface so as to prevent the filter fabric from being damaged in this area should the filter fabric contact the plastic disk.

[0012] In one embodiment of the invention, the pump connection neck, is performed as one unitary piece with the supporting body and with the supporting feet.

[0013] Preferably the pump connection neck, too, is in one piece with the plastic disk. As a result, preferably the entire unit is formed as one unitary member.

[0014] In another preferred embodiment of the present invention, the pump connection neck is formed as one piece with the supporting body and the supporting feet are formed as one piece with the plastic disk. The separate one-piece feet and disk member is then fixed to the pump connection neck. This embodiment avoids the need for complicated undercuts in the molds used to mold the filter parts.

[0015] Preferably, this embodiment can be further improved in that the top ends of the supporting feet are connected in one piece with an annular body which is received in an annular groove provided in the bottom edge of the pump connection neck.

[0016] In the embodiment with separate pieces, the connection between the pump connection neck and the separate unitary member is preferably made by a process selected from the groups consisting of glueing and welding.

[0017] Preferably the pump connection neck is ultrasonically welded to the separate unitary member.

[0018] In an especially preferred embodiment of the present invention, the pump connection neck is insert injection-molded onto the filter fabric.

[0019] Examples of the invention are shown in the drawings and in the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

Fig. 1 a schematic side view in cross-section of a preferred embodiment of the fuel filter according to

the invention;

Fig. 2 a cross-sectional view taken along line 2-2 in Fig. 1.

Fig. 3 is a top plan view of second preferred embodiment of the present invention.

Fig. 4 is a cross-sectional view taken along line 4-4 of Fig. 3.

DETAILED DESCRIPTION OF THE DRAWINGS AND OF THE PREFERRED EMBODIMENTS

[0021] As shown in Figs. 1 and 2, one preferred fuel filter 1 of the present invention contains a supporting body 2 consisting of plastic. Supporting body 2 preferably has a typical construction consisting of bars 2A having spreader elements 2B. The supporting body 2 is enclosed in a plastic filter fabric 3 which performs the filtration function.

[0022] The top side 4 of the filter 1 is provided with a pump connection neck 6 of usual construction. Its bottom end 7 extends closely to the bottom 5 of the filter 1. As shown in FIG. 1, the pump connection neck 6 is preferably in one piece with the supporting body 2 and is preferably directly injection molded onto the filter fabric 3. Details of this kind of construction are described in EP Patent Publication No. 0 400 170 B1, incorporated herein by reference.

[0023] The pump connection neck 6 has an inlet opening 9 for the filtered fuel, which is surrounded by a plurality of supporting feet 10. The fuel filter 1 is connected by its pump connection to the suction side of a fuel pump or other conveying means (not shown). The filter and pump are then positioned in the interior of a fuel tank of a motor driven vehicle (not shown). The fuel surrounding the filter fabric 3 reaches the inlet opening 9 via the filter fabric 3. Dirt particles and the like are separated by the filter fabric 3.

[0024] According to this first preferred embodiment of the invention, the inlet opening 9 is completely covered by a plastic disk 12 extending normal to the axis 14 of the pump connection neck 6. The disk 2 is connected with the bottom ends 13 of the supporting feet 10. By this measure the axial flow of the fuel from the inlet opening 9 to the suction side 11 is prevented. The filtered fuel therefore exclusively flows radially into the pump connection neck 6 through the spaces between the feet 10. The flow of the fuel is shown by the arrow 16.

[0025] As further can be seen from Fig. 1, the plastic disk 12 extends parallel to the bottom of the filter 1. The side of the plastic disk 12 facing the bottom 5 of the filter 1 has a smooth surface.

[0026] In the preferred embodiment shown in Figs. 1 and 2, the supporting feet 10 are performed as a separate one-piece member 15 with the plastic disk 12. The one-piece member 15 is then connected with the pump connection neck 6. The top ends 17 of the supporting feet 10 are connected with an annular body 19. The annular body 19 is received by an annular groove 21 in the bottom edge of the pump connection neck 6 and connected thereto either by glueing or preferably by ultrasonic welding.

[0027] In a different embodiment of the invention, however, the entire unit which is enclosed in the filter fabric 3 can be performed as one unitary piece. In this embodiment the pump connection neck 6 with the supporting body 2, the supporting feet 10 and the plastic disk 12 are formed as one monolithic member, which is also preferably directly injection molded onto the filter fabric 3.

[0028] Further modifications or alternations of the invention are obvious to the expert in this field and are included in the basic idea of the invention, which is to interrupt an axial flow of the filtered fuel into the pump connection neck 6.

[0029] The filter fabric 3 is preferably made from a polyamide, although other polymers that are resistant to fuels and common fuel additives can also be used. The filter fabric could be monofilament or multifilament woven filtration medias; for example, square weave polymer monofilament; plain, reverse Dutch weave nylon, Saran, polyester or other polymer monofilament; or twill weave monofilament. The pump connection neck 6, supporting body 2 and disk 12 are preferably polyacetals, although other thermal plastics compatible with fuel and additives may be used.

[0030] A second preferred embodiment of the invention is shown in Figs. 3 and 4. In this embodiment, the fuel filter 20 is made from top and bottom webs of filtration media 22, 23 sealed together around the filter perimeter 24, and also encloses a plastic supporting body 26 formed as a monolithic unit with the pump connection neck 28 and its supporting feet 32 and the plate 34 attached at the bottom of the feet 32. Also, the filtration media 22 is insert injection molded with the pump connection neck 28. The plate 34 is in the shape of a disk, but is slightly smaller than the diameter of the inlet opening of the pump connection neck. The fluid flow into the pump connection neck, shown by arrows 37, is therefore still predominantly radially, through the spaces 36 between the supporting feet 32.

[0031] Filtration media useful in the invention can be of many different types, and is still being evaluated. One preferred filtration media 22 is a depth filtration media which is laminated from four layers. The top, outer layer is a 132 micron woven nylon 6/6 screen. The next layer is a layer of 0.5 ounce/yd^2 (OSY) spun bonded nylon 6/6. The third layer is of melt blown nylon 6. The fourth layer is 0.5 OSY spun bonded nylon 6/6. The materials are embossed together into a laminate. The melt blown nylon provides most of the filtration performance. The preferred melt blown layer has a Frazier Air Permeability of 110 to 225 ft^3/ft^2/min., a basis weight of 50-80 grams/m^2, and is made of fibers having a diameter of 2-10 mi-

crometers, with a mean diameter of 4 micrometers.

[0032] The filter 20 is preferably constructed by punching out a circular hole in the media 22 and insert injection molding the monolithic pump connection neck 28/ supporting body 26/ supporting feet 32/ plate 34 component onto the media. Next a bottom layer 23 of media is welded at perimeter 24 to the media 22 injection molded to the pump connection neck, and excess media trimmed.

[0033] It should be appreciated that the apparatus of the present invention is capable of being incorporated in the form of a variety of embodiments, only a few of which have been illustrated and described above. The described embodiments are to be considered in all respects only as illustrative and not restrictive, and the scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

Claims

1. In-tank fuel filter (1, 20) which by means of a pump connection neck (6, 28) is attached to an in-tank fuel pump, the filter (1, 20) having a supporting body (2, 26) consisting of plastics which is completely enclosed in a plastic filter fabric (3, 22, 23), wherein the fuel is sucked through the filter fabric (3, 22, 28), wherein the pump connection neck (6, 28) is positioned on the top side of the filter (1, 20), the lower end of which is extending in close proximity to the bottom of the filter (1, 20), and wherein the pump connection neck (6, 28) is having an inlet opening (9) which is surrounded by a plurality of supporting feet (10, 32), **characterized in** that the bottom ends (13) of the supporting feet (10, 32) are connected by a plastic disk (12, 34) inside the filter fabric (3, 22, 23), which is extending normal to the axis (14) of the pump connection neck (6, 28) and, in that the plastic disk (12, 34) is overlying the inlet opening (9) such, that the filtered fuel only or at least predominantly can flow radially into the inlet opening (9) of the pump connection neck (6, 28).

2. Fuel filter according to claim 1, characterized in that the plastic disk (12) is completely covering the inlet opening (9) of the pump connection neck (6).

3. Fuel filter according to claim 1, characterized in that the plastic disk (34) is slightly smaller than the diameter of the inlet opening (9) of the pump connection neck (28).

4. Fuel filter according to any of the claims 1 to 3, characterized in that the plastic disks (12, 34) extends parallel to the bottom (5) of the filter (1, 20) within the filter fabric (3; 22, 23).

5. Fuel filter according to any of the claims 1 to 4, characterized in that the side of the plastic disk (12, 34) facing the filter fabric (3, 22, 23) on the bottom (5) of the filter (1, 20) has a smooth surface.

6. Fuel filter according to any of the claims 1 to 5, characterized in that the pump connection neck (6, 28) is performed as one unitary piece with the supporting body (2, 26) and the supporting feet (10, 32).

7. Fuel filter according to claim 6, characterized in that the pump connection neck (6, 28) is performed as one unitary piece with the plastic disk (12, 34).

8. Fuel filter according to any of the claims 1 to 5, characterized in that the pump connection neck (6) is unitary with the supporting body (2) and the supporting feet (10) and the plastic disks (12) are formed as a separate unitary member (15) which is fixed to the pump connection neck (6).

9. Fuel filter according to claim 8, characterized in that the top ends (17) of the supporting feet (10) are connected in one piece with an annular body (19) which is received in an annular groove (21) provided in the bottom edge of the pump connection neck (6).

10. Fuel filter according to claim 8 or 9, characterized in shat the connection between the pump connection neck (6) and the separate unitary member (15) is made by a process selected from the group consisting of glueing and welding.

11. Fuel filter according to claim 10, characterized in that the pump connection neck (6) is ultrasonically welded to the separate unitary member (15).

12. Fuel filter according to any of the preceding claims, characterized in that the pump connection neck (6, 28) is injection molded onto the filter fabric (3, 22, 23).

Revendications

1. Filtre à carburant situé dans un réservoir (1, 20) qui, par l'intermédiaire d'un col de connexion de pompe (6, 28), est relié à une pompe pour carburant situé dans le réservoir, le filtre (1, 20) ayant un corps de support (2, 26) constitué d'une matière plastique, qui est complètement enfermé dans un tissu filtrant de matière plastique (3, 22, 23), dans lequel le carburant est aspiré à travers le tissu filtrant (3, 22, 28), dans lequel le col de connexion de pompe (6, 28) est positionné sur le côté supérieur du filtre (1, 20), son extrémité inférieure s'étendant à proximité

étroite de la partie inférieure du filtre (1, 20) et dans lequel le col de connexion de pompe (6, 28) a une ouverture d'entrée (9) qui est entourée par plusieurs pieds de support (10, 32), caractérisé en ce que les extrémités inférieures (13) des pieds de support (10, 32) sont reliées par un dispositif en matière plastique (12, 34) situé à l'intérieur du tissu filtrant (3, 22, 23), qui s'étend perpendiculairement à l'axe (14) du col de connexion de pompe (6, 28) et en ce que le disque en matière plastique (12, 34) recouvre l'ouverture d'entrée (9) de telle sorte que le carburant filtré, seul ou au moins de manière prédominante, peut s'écouler radialement dans l'ouverture d'entrée (9) du col de connexion de pompe (6, 28).

2. Filtre à carburant selon la revendication 1, caractérisé en ce que le disque en matière plastique (12) recouvre entièrement l'ouverture d'entrée (9) du col de connexion de pompe (6).

3. Filtre à carburant selon la revendication 1, caractérisé en ce que le disque en matière plastique (34) est légèrement plus petit que le diamètre de l'ouverture d'entrée (9) du col de connexion de pompe (28).

4. Filtre à carburant selon l'une quelconque des revendications 1 à 3, caractérisé en ce que le disque en matière plastique (12, 34) s'étend parallèlement à la partie inférieure (5) du filtre (1, 20) dans le tissu filtrant (3 ; 22, 23).

5. Filtre à carburant selon l'une quelconque des revendications 1 à 4, caractérisé en ce que le côté du disque en matière plastique (12, 34) dirigé vers le tissu filtrant (3 ; 22, 23) situé sur la partie inférieure (5) du filtre (1, 20) a une surface lisse.

6. Filtre à carburant selon l'une quelconque des revendications 1 à 5, caractérisé en ce que le col de connexion de pompe (6, 28) est réalisé sous forme d'une pièce unitaire avec le corps de support (2, 26) et les pieds de support (10, 32).

7. Filtre à carburant selon la revendication 6, caractérisé en ce que le col de connexion de pompe (6, 28) est réalisé sous forme d'une pièce unitaire avec le disque en matière plastique (12, 34).

8. Filtre à carburant selon l'une quelconque des revendications 1 à 5, caractérisé en ce que le col de connexion de pompe (6) est en un seul bloc avec le corps de support (2) et les pieds de support (10) et le disque en matière plastique (12) est formé sous forme d'un élément unitaire séparé (15) qui est fixé sur le col de connexion de pompe (6).

9. Filtre à carburant selon la revendication 8, caractérisé en ce que les extrémités supérieures (17) des pieds de support (10) sont reliées en un seul bloc à un bord annulaire (19) qui est reçu dans une gorge annulaire (21) prévue dans le bord inférieur du col de connexion de pompe (6).

10. Filtre à carburant selon la revendication 8 ou 9, caractérisé en ce que la connexion entre le col de connexion de pompe (6) et l'élément unitaire séparé (15) est constituée par un procédé choisi parmi le groupe constitué d'un collage et d'un soudage.

11. Filtre à carburant selon la revendication 10, caractérisé en ce que le col de connexion de pompe (6) est soudé par ultrasons sur l'élément unitaire séparé (15).

12. Filtre à carburant selon l'une quelconque des revendications précédentes, caractérisé en ce que le col de connexion de pompe (6, 28) est moulé par injection sur le tissu filtrant (3, 22, 23).

Patentansprüche

1. Im Tank angeordneter Kraftstoff-Filter (1, 20), welcher mittels eines Pumpenanschlußstutzens (6, 28) mit einer ebenfalls im Tank angeordneten Kraftstoffpumpe verbunden ist, wobei der Filter (1, 20) einen aus Kunststoff bestehenden Stützkörper (2, 26) aufweist, welcher vollständig in ein aus Kunststoff bestehendes Filtergewebe (3, 22, 23) eingeschlossen ist, wobei der Kraftstoff durch das Filtergewebe (3, 22, 28) gesaugt wird, wobei ferner der Pumpenanschlußstutzen (6, 28) auf der Oberseite des Filters (1, 20) angeordnet ist und sich mit seinem Unterende bis nahe zum Boden des Filters (1, 20) erstreckt, und wobei der Pumpenanschlußstutzen (6, 28) eine Einlaßöffnung (9) aufweist, welche durch eine Vielzahl von Stützfüßen (10, 32) umgeben ist, **dadurch gekennzeichnet,** daß die Unterenden (13) der Stützfüße (10, 32) durch eine Kunststoffscheibe (12, 34) innerhalb des Filtergewebes (3, 22, 23) verbunden sind, welche sich normal zur Achse (14) des Pummpenanschlußstutzens (6, 28) erstreckt, und daß die Kunststoffscheibe (12, 34) die Einlaßöffnung (9) derart überlagert, daß der gefilterte Kraftstoff ausschließlich oder zumindest überwiegend radial in die Einlaßöffnung (9) des Pumpenanschlußstutzens (6, 28) strömen kann.

2. Kraftstoff-Filter nach Anspruch 1, dadurch gekennzeichnet, daß die Kunststoffscheibe (12) die Einlaßöffnung (9) des Pumpenanschlußstutzens (6) vollständig überdeckt.

3. Kraftstoff-Filter nach Anspruch 1, dadurch gekennzeichnet, daß die Kunststoffscheibe (34) geringfü-

FIG. 1

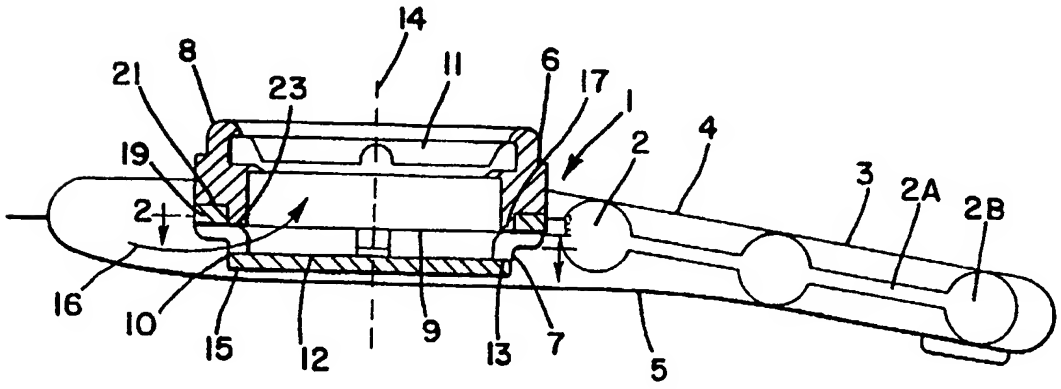

FIG. 2

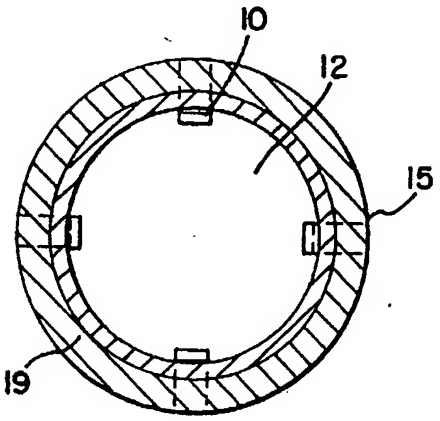

FIG.3

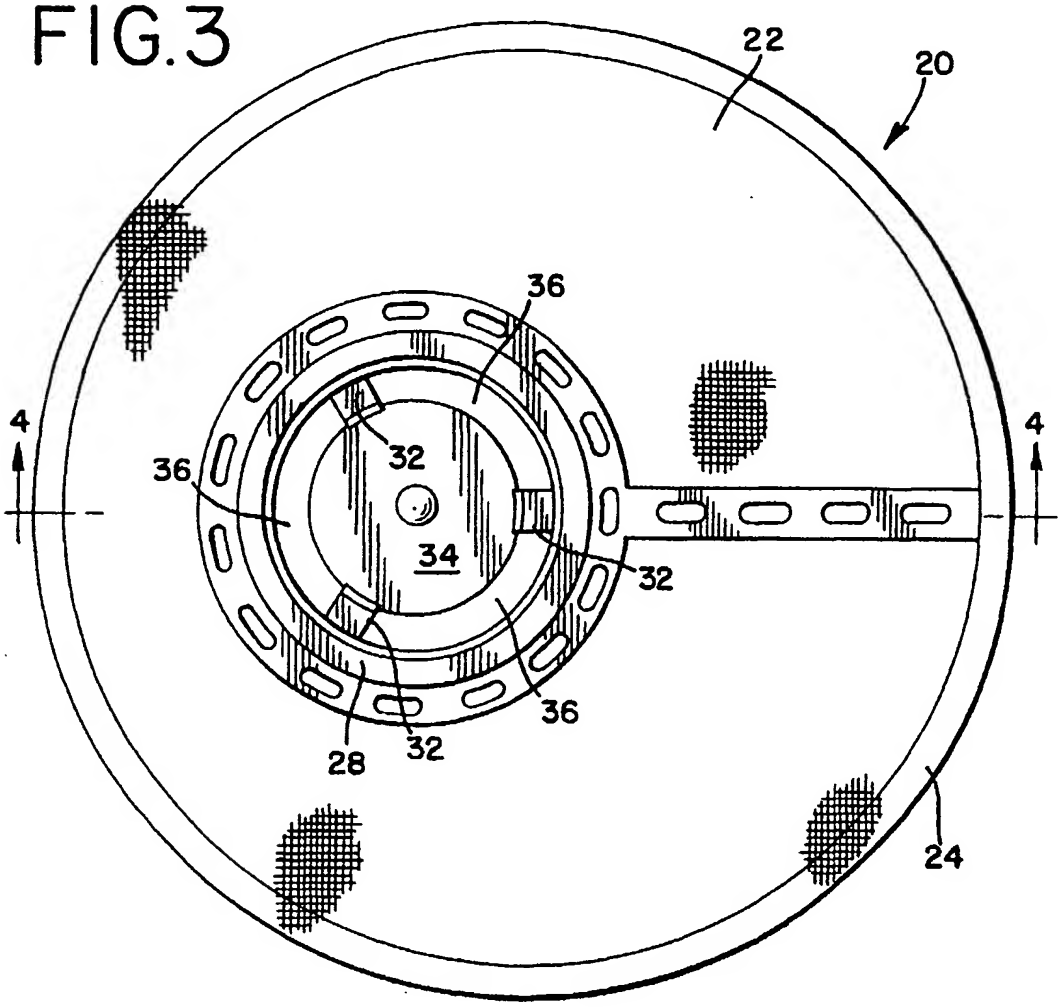

FIG.4